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Challenges Associated with the Secondary Use of Nursing Data

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Abstract. There is a prevailing 'collect once, use many times' view of clinical data and its secondary use. This study challenges this view through an assessment of the degree to which the International Classification for Nursing Practice (ICNP) might be used to provide raw data for the Belgian Nursing Minimum Data Set (B-NMDS). A mapping exercise identified exact matches between ICNP and B-NMDS for just 8% of B-NMDS care descriptions; no matches at all for 23%; possible broader matches in ICNP for55%; possible narrower matches for 8%; and a possible broader and narrower match for 1%. Refining ICNP content and developing and implementing purposive data sets or catalogues that accommodate both ICNP concepts and B-NMDS care descriptions would lay the foundations for the potential re-use of primary ICNP-encoded data in populating the B-NMDS. One unexpected result of the study was to re-affirm the utility of ICNP as a reference terminology.

Keywords. nursing, case mix, terminology, classification

Introduction

A standardised terminology, an organized set of terms that is designed to be shared among stakeholders, is an important component of any informatics infrastructure that purports to support contemporary nursing practice[1]. There is a long-held prevailing view that nursing and other health care data can be collected just once and used many times for a variety of different purposes[2] - so-called 'secondary use' of data. Examples of the secondary use of data include mortality and morbidity reporting, public health surveillance, clinical audit and, particularly relevant to this study, hospital financing.

Even though it represents a very significant cost in most health care settings, nursing is not well represented in today's hospital billing or case mix systems. Several countries reimburse for nursing care as part of a fixed daily 'room rate'. However, this approach has been shown to underestimate actual nursing costs e.g. by over 30%[3]. Other countries adjust for variations in nursing care by applying an average nursing resource weighting to Diagnosis Related Groups (DRG). While this averaging does

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accommodate variations between DRGs, it does not reflect different intensities of nursing care within any particular DRG.

The use of nursing data in combination with DRGs can improve the explanation of variance across a range of indicators, sometimes dramatically e.g. from 30% for length of stay to 146% for hospital death[4]. Hence, this approach has been applied, for example, within Belgium, where the Belgian Nursing Minimum Data Set (B-NMDS) is used to characterise and compare nursing care activities and costs, and to demonstrate the value of nursing[5].

While secondary use often involves the aggregation of primary data and its transformation into or representation using classifications such as the International Classification of Diseases (ICD), the B-NMDS relies on a dedicated collection of specific data, so-called 'care descriptions'. Rather than representing relatively general concepts that tend to be associated with secondary use e.g. categories within ICD, care descriptions within the B-NMDS describe relatively specific nursing activities and in many respects resemble interface terms.

In this study we explore the 'collect once, use many times' view in the context of this alternative view of secondary use by assessing the degree to which one standardised terminology, the International Classification for Nursing Practice (ICNP©), might be used to provide raw data for the B-NMDS.

1. Materials

1.1. ICNP

ICNP, a product of the International Council of Nurses (ICN) eHealth Programme, is a standardized terminology that seeks to support nursing practice and patient care worldwide[6]. It is a Related Classification within the World Health Organisation Family of International Classifications, it is recognized by the American Nurses Association as a terminology that supports nursing practice, and agreements are in place with Sabacare Inc. for harmonization with the Clinical Care Classification and with the International Health Terminology Standards Development Organisation (IHTSDO) for harmonization with SNOMED-CT. An additional 'public good' agreement is in place with IHTSDO to ensure the wide dissemination of an ICNP-SNOMED CT equivalence table or mapping. ICNP is built on a formal Web Ontology Language (OWL) description logic foundation, which accommodates both interface properties (to facilitate use at the point of care) and reference properties (for secondary use of data and harmonization with other terminologies), and which facilitates the controlled development of pre-coordinated statements from more rudimentary concepts. ICNP is updated and released every two years. The 2013 release includes 3,894 concepts, of which 1,589 are pre-coordinated statements (41%). In order to support implementation, a number of ICNP Catalogues (subsets of ICNP with additional data elements as necessary) have been developed to support nursing practice in different specialties, in different settings and with different client groups. ICNP has been translated into 15 different languages (with additional translations currently in progress).

1.2. B-NMDS

There are few countries worldwide that have implemented a NMDS on a widespread scale[7]. Use of the B-NMDS has been mandated by the Belgian Ministry of Public Health since 1988. The content of the original B-NMDS was based primarily on professional consensus and statistics derived from empirical tests[8]. Every 3 months (March, June, September, and December) data is collected by all hospitals in Belgium on every patient admitted as an inpatient over an agreed period of 15 days, using a standardized list of nursing interventions. Data is also collected on the number and qualifications of nurses directly involved in their care[9]. This has resulted in a unique nursing care database, covering more than 18 million inpatient days, that is used by hospital managers to support staffing decisions by the Ministry of Public Health to allocate a large proportion of the overall budget to hospitals (around 6.5% of the total). B-NMDS data can also be linked with administrative, medical and other patient data via a shared hospital minimum dataset (MZG/RHM). A second version of the B-NMDS was implemented in 2008 using the Nursing Interventions Classification (NIC) [10] as a framework[11]. The B-NMDS currently comprises 79 items, sub-divided into 91 care descriptions that collectively cover 22 NIC Classes and 196 NIC interventions.

2. Methods

In order to demonstrate whether ICNP could be used as a source of data for the B-NMDS, we sought to find semantically-equivalent concepts within the two tools. Taking the collection of B-NMDS care descriptions as the source 'terminology' (this collection does not include any organizing or navigational categories) and ICNP concepts as the target terminology (only pre-coordinated ICNP statements were considered within this study), two members of the project team (NRH, KJ) independently attempted to identify equivalent concepts within ICNP. As the two reviewers were more familiar with ICNP than with the B-NMDS several resources were used to ensure adequate understanding of B-NMDS care descriptions. These included both the original source manual (French version) and translations made and published by the B-NMDS team[12] (these are used as identifiers for source B-NMDS care descriptions throughout this paper). On-line automatic translation tools and multi-lingual dictionaries were used also as necessary. Although this was not the primary goal of the study, where no equivalent concepts were found, reviewers attempted to find possible nearest matches, either narrower concepts or broader concepts within ICNP. The reviewers met to compare findings and to resolve disagreements.

3. Results

The 91 B-NMDS care descriptions formed the set of source concepts for this study. A summary of results is given in Table 1, and in graphical form in Figure 1.

Table 1. Summary of the results of mapping from B-NMDS care descriptions to ICNP pre-coordinated statements

Exact match	7 (8%)
Non-match	21 (23%)
Broader match in ICNP	55 (60%)
Narrower match within ICNP	7 (8%)
Broader and narrower	1 (1%)
TOTAL	91 (100%)

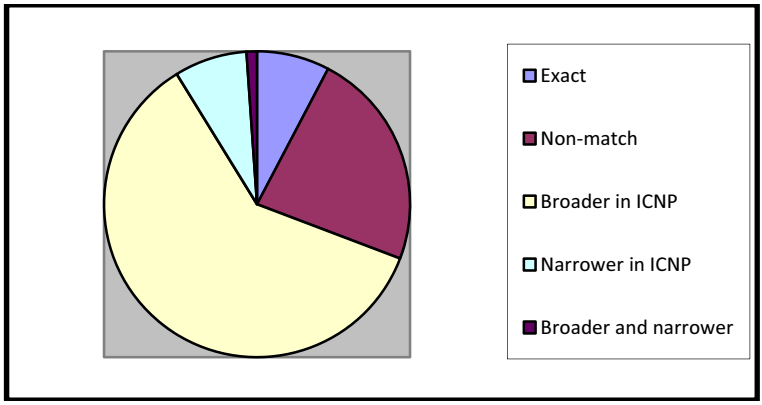

Figure 1. Graphical representation of the results of mapping from B-NMDS care descriptions to ICNP pre-coordinated statements

3.1. Exact matches

The reviewers agreed on an initial exact match for 4 concepts, and after discussion, agreed that there were exact matches for an additional 3 concepts, taking the total number of exact matching concepts to 7 (8%), as presented in Table 2.

Table 2. Examples of exact matches between B-NMDS care descriptions and ICNP concepts

B-NMDS care description	**Equivalent ICNP concept**
B250 Care for urinary catheter	Urinary Catheter Care [10033277]
B300 Bladder catheterization _ frequency	Catheterising Bladder [10030884]
E100 Symptoms management pain	Managing Pain [10011660]
W500 Kangaroo care	Promoting Kangaroo Care [10035361]

3.2. Non-matches

The reviewers agreed both before and after discussion that there was no match at all for 21 (23%) B-NMDS care descriptions including:

B500	Constipation prevention or treatment	O100_1	Activity support Group
F300	Support of day clothing	Z400	Contact with other institutions
I200_1	Pressure monitoring of intracranial fluid Without drainage		

3.3. Broader matches in ICNP

The reviewers agreed on an initial broader match within ICNP for 21 concepts, and after discussion, agreed that there were broader matches for an additional 34 concepts, taking the total number of possible broader matching concepts (including in one case more than one broader matching concepts) within ICNP to 55 (60%). Examples are presented in Table 3.

3.4. Narrower matches in ICNP

The reviewers agreed on an initial narrower match within ICNP for just one concept, and after discussion agreed that there were narrower matches for an additional 6 concepts, taking the total number of possible narrower matching concepts (including in 4 cases more than one narrower matching concepts) within ICNP to 7 (8%), as presented in Table 4.

Table 3. Examples of non-exact matches between B-NMDS care descriptions and broader ICNP concepts

B-NMDS care description	Broader ICNP concept
F110_1 Hygienic care at lavatory, bed or incubator Supervision	Assisting With Hygiene [10030821]
G100_1 Regulation of hydration and nutritional balance Hydration and nutrition 1/day	Managing Fluid Volume [10035240]
	Managing Nutritional Status [10036013]
L300 Simple care for open wound _ frequency	Wound Care [10033347]
N400 Arterial blood sampling _ frequency	Collecting Specimen [10004588]
W100 Relaxation care in preparation of child birth	Relaxation Therapy [10039191]

3.5. Broader and narrower

The reviewers agreed that there was both a possible broader match and a possible narrower match within ICNP for just one concept (1%), as presented in Table 5.

Table 4. Non-exact matches between B-NMDS care descriptions and narrower ICNP concepts

B-NMDS care description		Narrower ICNP concept(s)
B230	Care for the urinary incontinent patient	Managing Urination [10035238]
		Managing Urinary Incontinence [10031879]
D200	Care for child bottle and breast feeding	Supporting Breastfeeding [10032816]
		Teaching About Infant Feeding [10037139]
F200	Hygienic care education and training	Teaching Family About Hygiene Pattern [10038131]
		Promoting Hygiene [10032477]
L100	Supervision of wound dressing, materials and near skin	Assessing Wound [10030799]
Z200	Physician support in direct medical care _ frequency	Assisting Surgeon During Operation [10002866]

Table 5. Non-exact matches between B-NMDS care descriptions and both broader and narrower ICNP concepts

B-NMDS care description		Nearest ICNP concept
B210	Urinary elimination follow-up	Assessing Urinary Status [10036499] (broader)
		Measuring Fluid Output [10039250] (narrower)

4. Discussion

As mentioned previously, B-NMDS care descriptions resemble interface terms. Given that the foundation of ICNP purports to accommodate interface properties, there was a surprisingly low number of exact matches and a relatively high-number of non-matches between B-NMDS care descriptions and ICNP pre-coordinated statements.

One challenge within this study was that while the core B-NMDS documentation used was published in French, neither reviewer is fluent in French. Certain care descriptions were therefore difficult to interpret e.g. 24 h sober patient care. However, this would provide at best only a partial explanation of the paucity of exact matches.

With respect to many of the non-matches, while appropriate building blocks actually existed within ICNP at the time of the study e.g. Traction Device, Intracranial Pressure, Constipation, Putting On Clothes, Self-image, etc., these had not been incorporated into matching pre-coordinated statements i.e. there had not been any preceding use-case for their inclusion. In other cases the building blocks did not exist within ICNP e.g. dermatological lesion, sober patient. A simple solution would be

'build' new pre-coordinated statements out of existing and new building blocks. Previous related ICN initiatives have resulted in additional ICNP content.

The fact that equivalent ICNP pre-coordinated statements had not yet been built did not cover all non-matches. For some care descriptions it would be unlikely for equivalents to appear at all within ICNP. For example, the main focus of ICNP interventions is on direct care activities and, as such, one would not expect to see equivalent pre-coordinated intervention statements to certain care descriptions such as Structured physical exercises (a patient activity), Activity Support Group (a group activity) Rooming in of family or significant others (a caregiver activity), or Contact with other institutions (indirect activities), regardless of the fact that these may have financial implications for the organization. In this case, a solution would be to develop a catalogue or purposive data set that includes both matching ICNP concepts and non-ICNP care descriptions

Another example concerns care descriptions that may represent more than one intervention e.g. Constipation prevention or treatment, Artificial entry point supervision and/or care, Functional, mental, psychosocial assessment. A long-term goal for ICNP is to separate out composite interventions into their constituent parts. One therefore would not expect to find equivalents to such care descriptions. However, if equivalent ICNP statements were developed for any or all of the constituent parts (e.g. Constipation prevention) of combined care description (i.e. Constipation prevention or treatment) these would be considered narrower matches and would provide appropriate source data for the care description

A modest number of care descriptions did have potential matches with narrower ICNP statements. As might be expected, these tended to be multiple matches i.e. one care description had matches to multiple narrower ICNP statements. These narrower matches to ICNP, along with the exact matches, effectively represent the 'collect once'-level data that would provide appropriate source content for the B-NMDS. However, with coverage of only 14 care descriptions (15%), if ICNP is to fulfill its potential as a source of terms for tools such as the B-NMDS, there is clearly a need for further content development, as already indicated.

Approximately 2/3 of care descriptions had potential matches with broader ICNP statements. While this was not the desired outcome of the study, and while it does little to address the original aims of the study i.e. to use ICNP to provide raw data for the B-NMDS, it does bear out to some extent ICNP's potential as a reference terminology. It is reassuring that the interface-type B-NMDS care descriptions mapped onto nearly 70% of equivalent or more general ICNP statements.

5. Conclusion

This study challenges the prevailing 'collect once, use many' view of clinical data and its secondary use by assessing the degree to which a standardized terminology, ICNP, might be used to provide raw data for a hospital financing system. While the initial results expose challenges for ICNP, the study also identified terminological issues with B-NMDS, and provided simple solutions that would lay the foundations for the potential re-use of primary ICNP-encoded data in populating the B-NMDS. One unexpected result of the study was to re-affirm the utility of ICNP as a reference terminology.

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